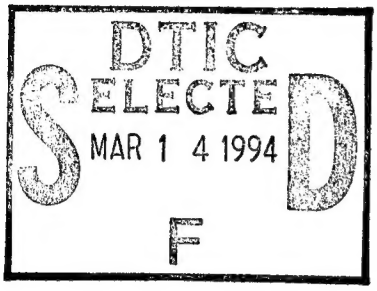
AOARD REPORT

Mitsubishi Electric Corp. Central Research Lab in Amagasaki, Hyogo



Apr 26 1993
S. J. Yakura
AOARD

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Date: 29 Apr 93

ABSTRACT:
The Mitsubishi Electric Corporation Central Research Laboratory is involved in the development of optical neuro devices for pattern recognition. The basic idea of the optical neuro device is to perform a vector multiplication in parallel. It uses the neural network concept to acquire the knowledge (in this case the desired pattern) from the real world through learning. It uses an array of GaAs photodetectors. I believe they are exploring a novel concept and we need to keep abreast of their progress. It has a significant impact on image recognition and identification of enemy planes, tanks, etc., during reconnaissance missions.

Subject: Trip Report, 26 Apr 93 - Central Research Laboratory, Mitsubishi Electric Corporation

Purpose: Talk with Dr. Kazuo Kyuma of Central Research Laboratory, Mitsubishi Electric Corp., and learn types of basic research carried out at this place.

Time and Place: 1300 - 1600, Central Research Laboratory, Mitsubishi Electric Corporation, 1-1 Tsukaguchi 8 Chome, Amagasaki, Hyogo-Ken 661, Japan. Along with the Central Research Laboratory, there are five other Mitsubishi Electric Corporation facilities located here. Two are factories which produce optical sensor equipments and communication devices, and the remaining three are research laboratories that deal with manufacturing development, materials and electronics devices, and industrial electronics and systems. These facilities are located within 10 minutes walk from one of the Japan Rail train stations, the Tsukaguchi train station. The Tsukaguchi train station is the next station after the Amagasaki train station. Coming from Osaka to Amagasaki, I took the Tokaido line heading west and got off at the second stop.

Observations and Comments:

1. I was greeted by Dr. K. Kyuma, Dr. Masanobu Takahashi, and Mr. Hiroshi Teratani. Dr. Kyuma, Deputy Chief of Solid State Quantum Electronics Department, gave me the overview of functional operations of the Central Research Laboratory. Dr. Takahashi, who works under Dr. Kyuma, presented the results of the on-going research on optical neuro devices. He gave me five recent publications by researchers in his group on this topic. Dr. Takahashi explained to me that research in optical neuro device is very active due to its applications in pattern recognition.

The basic idea of the optical neuro device is to perform a vector multiplication in parallel for inputs that consist of numbers in the x direction (or row) and y direction (column). It uses the neural network concept to acquire the knowledge (this case the desired pattern) from the real world through learning. Using the GaAs photodetectors, an 8 x 8 element optical neuro device can be built to the size of 100 x 100 (micrometer)**2. In this research area, Mitsubishi is taking a lead in developing the optical neuro chips. They have demonstrated that for a simple two dimensional pattern, the optical neuro chip can be used to reproduce the pattern after a few hundred learning cycles, which translate to less than a second in real time. I think their work is novel and we need to keep abreast of their progress. It has a significant impact on image recognition of identifying enemy planes, tanks, etc., during reconnaissance missions.

2. Mr. Teratani, who works in the Strategic Planning Department, briefed me of the organizational structure of the Central Research Laboratory. He said that in the current market situation, solid state quantum electronics and molecular electronics are two of the most active departments out of eight departments. Attached are organizational charts of Mitsubishi Electric Corporations and four laboratories located at the site I visited.

3. Mr. Teratani also told me that Mitsubishi Electric Corp. has established another site for optoelectronics research in Itami, just about 15 minutes from the Central Research Laboratory. I did not had time to make a visit the site this time, but I believe I should make a plan to visit there sometimes in the near future.